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09/329,889	06/10/1999	STEPHANE BOUSSAC	005974/00011	8734

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EXAMINER	
THANGAVELU, KANDASAMY	
ART UNIT	PAPER NUMBER
2123	

DATE MAILED: 05/21/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/329,889	Applicant(s) BOUSSAC ET AL:	
	Examiner Kandasamy Thangavelu	Art Unit 2123	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *06 February 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15,17,18 and 21-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-15, 17-18, 21-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *10 June 1999* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Introduction

1. This communication is in response to the Applicants' Amendment dated February 06, 2002. Claims 1-6, 9-15 and 17-18 were amended. Claims 21-24 were added. Claims 16, 19-20 were deleted. Claims 1-15, 17-18 and 21-24 of the application are pending.

Drawings

2. This application has been filed with informal drawings that are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Figures 11-14 are objected to due to shading problems. The applicant is advised to provide these drawings with alternate hatching schemes. Figure 10 is objected to because it does not have a legend. See MPEP § 608.02.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. §112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 10, 18 and 21 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 10 and 18 state "each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume". Claim 21 states "each free neighborhood comprising an area wherein motion of the corresponding one of the entities comprises motion on the boundary of the swept volume". This is new material added in the amendment and not found in the original specification.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 1-15, 17-18 and 21-24 of the application are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

These claims are rejected because they use the concept of free neighborhood directly or as claims dependent on independent claims that use the concept of free neighborhood. The specification appears to have ***inconsistent*** descriptions of free neighborhood throughout, thus making the claims indefinite.

7.1 Claim 1 specifies a software control method of modeling a swept volume for a computer simulated object. The method includes "determining a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities". From Claims 2, 3 and 4, it is understood that the entities include edge, triangle and vortex. So the method includes determining the free neighborhoods for these three entities.

The specification states, "Free neighborhood is represented by angular portions for various entities forming boundary of polygon". (Page 2, Para 3). This is consistent with the specification, Page 6, Para 2, "For a point P, the free neighborhood is the set of points belonging to the neighborhood of P, such that the neighborhood is not inside the material of P". But this appears to be ***inconsistent*** with the newly added description of the free neighborhood appearing in dependent Claim 10 that states, "each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume".

7.2 Claim 4 states, "a first one of entities is a vertex formed at an intersection of a first and a second edge of the modeled object and a corresponding first one of the free neighborhoods is defined by an angular extension of the first and second edges". Why is the free neighborhood of the vortex limited by angular extension of the first and second edges?

Additionally, with respect to Claim 4, in Fig. 5 the free neighborhood of a point is shown by two circular sectors delimited by the extensions of the edges of the polygon. Why is it that the free neighborhood does not ***include all the area around the point***, outside the polygon? Why is it limited to two circular sectors?

7.3 Claim 5 states, "a first one of the free neighborhoods comprises a material zone represented by a half sphere containing material of the modeled object and delimited by a plane of a triangle". This agrees with the specification, Page 2, Para 3, " Free neighborhood is a material zone, represented by half sphere containing the material of the object and delimited by a triangle". Figure 5 shows the material zone being inside the polygon. Does the free neighborhood consist of points or space outside the object or does it include the space or volume inside the object? Does the sphere mean that free neighborhood is volume and not area? There appears to be ***inconsistency*** in the description of material zone as free neighborhood, as the material zone is inside the polygon or inside the material of the object.

"Free neighborhood is a material zone, represented by half sphere containing the material of the object" also appears to be ***inconsistent*** with the newly added description of the free neighborhood, "each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume". Dependent Claims 5 and 10, when considered with independent claim 1, each appear to be ***inconsistent***.

7.4 Claim 6 states, "a first one of the free neighborhoods comprises a tangent zone represented by two portions of a sphere, wherein the two portions of the sphere are delimited by planes of adjacent triangles". This agrees with the specification, Page 2, Para 3, "Free neighborhood is a tangent zone, represented by two portions of a sphere, the two portions of the sphere delimited by planes of adjacent triangles". Figure 5 shows the tangent zone being outside the polygon.

"Free neighborhood is a tangent zone, represented by two portions of a sphere, the two portions of the sphere delimited by planes of adjacent triangles" also appears to be ***inconsistent*** with the newly added description of the free neighborhood, "each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume". So Claim 6 and Claim 10 appear to be ***inconsistent*** with each other.

7.5 Claim 14 states "a first one of the entities comprising an edge has a corresponding free neighborhood comprising a tangent zone". This is consistent with the specification, Page 7, Para 3, "Free neighborhood of an edge is a tangent zone, represented by two portions of a sphere, delimited by planes of adjacent triangles". But this appears to be ***inconsistent*** with Figure 5, where the free neighborhood of a point is shown as the tangent zone.

7.6 Claim 15 states "a first one of the entities comprising a triangle has a corresponding free neighborhood comprising a material zone". This is consistent with the specification, Page 7, Para 2, "Free neighborhood of a triangle is a material zone, represented by half sphere containing the material of the object and delimited by a plane of a triangle". But this appears to be ***inconsistent*** with Figure 5, where the free neighborhood of an edge is shown as the material zone. The material zone is inside the polygon and not on the boundary of the swept volume.

7.7 Claim 21 states, "for each of a second plurality of entities comprising entities on the boundary of the object that are also on the boundary of the swept volume and entities on the

boundary of the object that are not on the boundary of the swept volume". When will the entities on the boundary of the object not be on the boundary of the swept volume?

7.8 Claim 22 states, "the plurality of entities comprise modeled object features selected from the group consisting of object edges and object vertices". This appears to be ***inconsistent*** with Claims 2 and 3, which state that the plurality of entities comprises an edge and a triangle.

7.9 Claim 24 states, "material zone free neighborhoods are associated with object edge entities and tangent zone free neighborhoods are associated with object vertex entities". This appears to be ***inconsistent*** with Claims 14 and 15, which state, "a first one of the entities comprising an edge has a corresponding free neighborhood comprising a tangent zone" and "a first one of the entities comprising a triangle has a corresponding free neighborhood comprising a material zone".

8. Claim 18 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 18 starts with "the computer program residing on a computer readable medium of Claim 19". Claim 18 is indefinite because Claim 19 deals with a method of interacting with a computer so as to model a swept volume; Claim 19 does not deal with the computer program residing on a computer readable medium.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claims 1-15, 17-18 and 21-24 of the application are rejected under 35 U.S.C. 101 because the claimed inventions are directed to non-statutory subject matter.

Claim 1 states, "A software control method of modeling a swept volume for a computer simulated object". The computer simulated object could be an abstract object. There is no indication of real world object. What will be the practical application if you are computing the swept volume of an abstract object? Swept volume is not really useful, unless it is indicative of a practical application. This is the basis for rejecting Claim 1 and its dependent Claims 2-10 under 35 U.S.C. 101.

Claim 11 states, "a polyhedral representation comprising a plurality of entities of a computer modeled object is generated". The computer modeled object could be an abstract object. There is no indication of real world object. What will be the practical application if you are computing the swept volume of an abstract object? Swept volume is not really useful, unless it is indicative of a practical application. This is the basis for rejecting Claim 11 and its dependent Claims 12-15 under 35 U.S.C. 101.

Claim 17 states, "generate a polyhedral representation of a computer modeled object". The computer modeled object could be an abstract object. There is no indication of real world object. What will be the practical application if you are computing the swept volume of an

abstract object? Swept volume is not really useful, unless it is indicative of a practical application. This is the basis for rejecting Claim 17 and its dependent Claim 18 under 35 U.S.C. 101.

Claim 21 states, "A software implemented method of modeling a swept volume for a computer simulated object". The computer simulated object could be an abstract object. There is no indication of real world object. What will be the practical application if you are computing the swept volume of an abstract object? Swept volume is not really useful, unless it is indicative of a practical application. This is the basis for rejecting Claim 21 and its dependent Claims 22-24 under 35 U.S.C. 101.

Claim Rejections - 35 USC § 102

11. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

12. Claims 1-3, 9-13, 17-18 and 21-22 are rejected under 35 U.S.C. 102(e) as being anticipated by **Xavier (XA)** (U.S. Patent 6,099,573).

12.1 **XA** teaches Method and apparatus for modeling Interactions. Specifically, as per Claim 1, **XA** teaches a software control method of modeling a swept volume for a computer simulated

object. (Col 3, Lines 14-17). **XA** teaches generating a polyhedral representation of a computer modeled object, the representation comprising a plurality of entities. (Col 3, Lines 24-25). **XA** teaches representing motion of the object by a series of sequential positions of the object. (Col 4, Lines 41-44). **XA** teaches bounding volume representations and hierarchical geometric representations. The hierarchical geometric representation contains a conservative approximation or wrapper of the object. Thus XA teaches for each position in the series of sequential positions of the object, determining a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities. (Col 2, Lines 9-10 and Col 4, Lines 19-36).

XA teaches for each position in the series of sequential positions of the object, determining a subset of the entities comprising entities having a trajectory through their corresponding free neighborhood during motion of the object from a current position to a next position. (Col 4, Lines 26-32). **XA** teaches for each position in the series of sequential positions of the object, generating a trace of the motion of the subset of entities between the current and the next position, and constructing a representation of the swept volume from the generated traces. (Col 3, Lines 29-34).

12.2 As per Claim 2, **XA** teaches the software control method of Claim 1. **XA** also teaches that the plurality of entities comprises an edge. (Col 3, Lines 24-25).

12.3 As per Claim 3, **XA** teaches the software control method of Claim 1. **XA** also teaches that the plurality of entities comprises a triangle. (Col 3, Lines 24-25).

12.4 As per Claim 9, **XA** teaches the software control method of Claim 1. **XA** also teaches that the motion between two consecutive matrices is modeled as linear motion. (Col 3, Lines 27-32 and Col 4, Lines 48-55).

12.5 As per Claim 10, **XA** teaches the software control method of Claim 1. **XA** also teaches that each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume. (Col 5, Lines 54-57).

12.6 As per Claim 11, **XA** teaches a computer system for controlling generation of a swept volume model, the system comprising a processor operatively interconnected to a memory, a user input device, a display and a graphical user interface responsive to activation with the user input device by causing a program stored in the memory to be executed by the processor. (Col 12, Lines 55-65). **XA** teaches the program configuring the processor to perform computations whereby a polyhedral representation comprising a plurality of entities of a computer modeled object is generated. (Col 3, Lines 24-25). **XA** teaches motion of the object is represented with a set of position matrices. (Col 4, Lines 41-44). **XA** teaches for each of a series of sequential positions of the object represented by the matrices, a subset of the entities comprising entities remaining within their corresponding free neighborhood during motion of the object from a current to a next position is determined. (Col 4, Lines 26-32). **XA** teaches for each of a series of sequential positions of the object represented by the matrices, traces are generated by the motion of the subset of entities during motion between a current and a next position, and a representation of the swept volume is constructed from the traces. (Col 3, Lines 29-34).

12.7 As per Claim 12, **XA** teaches the software control method of Claim 1. **XA** also teaches that the position matrices representing motion comprise data collected during physical experiments. (Col 4, Lines 8-10).

12.8 As per Claim 13, **XA** teaches the software control method of Claim 1. **XA** also teaches that the position matrices representing motion of the free neighborhood entities are calculated in response to selection of a motion type from a user interactive menu. (Figure 2).

12.9 As per Claim 17, **XA** teaches a computer program residing on a computer-readable medium, the program comprising instructions for causing the computer to generate a polyhedral representation of a computer modeled object, the representation comprising a plurality of entities. (Figure 1 and Col 3, Lines 24-25). **XA** teaches that the program comprises instructions for causing the computer to represent motion of the object with a set of position matrices representing sequential positions of motion of the object. (Col 4, Lines 41-44). **XA** teaches bounding volume representations and hierarchical geometric representations. The hierarchical geometric representation contains a conservative approximation or wrapper of the object. Thus XA teaches that for each of a series of sequential positions of the object, the program comprises instructions for causing the computer to determine a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities. (Col 2, Lines 9-10 and Col 4, Lines 19-36).

XA teaches that for each of a series of sequential positions of the object, the program comprises instructions for causing the computer to determine a subset of the entities comprising entities having a trajectory through their corresponding free neighborhood during motion of the object from a current position to a next position represented by the matrices. (Col 4, Lines 26-32). **XA** teaches that for each of a series of sequential positions of the object, the program comprises instructions for causing the computer to generate a trace of the motion of the free neighborhood entities between the current and the next position and to construct a representation of the swept volume from the generated traces. (Col 3, Lines 29-34).

12.10 As per Claim 18, **XA** teaches the computer program residing on a computer readable medium of Claim 17. **XA** also teaches that each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume. (Col 5, Lines 54-57).

12.11 As per Claim 21, **XA** teaches a software-implemented method of modeling a swept volume of a computer simulated object. (Figure 1 and Col 3, Lines 14-17). **XA** teaches that the method includes storing data representing a plurality of sequential positions of the object. (Col 4, Lines 41-44). **XA** teaches that for each of the plurality of sequential positions, the method includes computing the swept volume of the object as the object moves between a current one of the positions and a next one of the positions. (Col 3, Lines 29-34).

XA teaches that the swept volume is computed by determining a first plurality of entities belonging to a boundary of the object and to a boundary of the modeled swept volume as the

object moves between the current and the next position. (Col 3, Lines 24-28). **XA** teaches bounding volume representations and hierarchical geometric representations. The hierarchical geometric representation contains a conservative approximation or wrapper of the object. Thus XA teaches that determining the first plurality includes for each of a second plurality of entities comprising entities on the boundary of the object that are also on the boundary of the swept volume and entities on the boundary of the object that are not on the boundary of the swept volume, determining a plurality of free neighborhoods each free neighborhood being associated with a corresponding one of the second plurality of entities. (Col 2, Lines 9-10 and Col 4, Lines 19-36).

XA teaches that each free neighborhood comprises an area wherein motion of the corresponding one of the entities comprises motion on the boundary of the swept volume. (Col 5, Lines 54-57). **XA** teaches that determining the first plurality includes computing trajectory of each of the entities during motion between the current and next position of the object to determine whether each entity moves within its corresponding free neighborhood. (Col 5, Lines 60-62). **XA** teaches that determining the first plurality includes designating each entity moving within in its corresponding free neighborhood as a member of the first subset. (Col 3, Lines 24-28). **XA** teaches that the swept volume is computed by forming a subsection of the boundary of the swept volume by tracing the first subset of entities in motion between the current position and the next position. (Col 5, Lines 54-62).

12.12 As per Claim 22, **XA** teaches the software implemented method of Claim 21. **XA** also teaches that the plurality of entities comprise modeled object features selected from the group consisting of object edges and object vertices. (Col 3, Lines 24-25).

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

14. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

15. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Xavier (XA)** (U.S. Patent 6,099,573) in view of **Abrams et al. (AB)** (IEEE).

15.1 As per Claim 7, **XA** teaches the method of Claim 1. **XA** does not expressly teach that the polyhedral representation comprises two triangles representing translational motion of an edge.

AB teaches that the polyhedral representation comprises two triangles representing translational motion of an edge. (Page 190, para 4 to Page 191). According to Abrams et al., such a representation leads to an efficient computation to model a polygon undergoing sliding motion. See Page 191, Column 1, Paragraphs 3-7. It would have been obvious to one of ordinary skill in the art at the time of Applicant's invention to modify the method of **XA** with the method of **AB** that included the polyhedral representation comprising two triangles representing translational motion of an edge, as that would provide for efficient modeling of translational motion using polyhedra.

Indication of Allowable Subject Matter

16. Subject to rejections listed above, and based on the prior art located to date and made of record, Claims 4-6, 8, 14-15 and 23-24 do not appear to be taught or rendered obvious, and are indicated as allowable subject matter.

Applicants' Arguments

17. Applicants make the following arguments:

    1. Applicants argue that the rejections made under 35 USC §101 are inapplicable because each of the claims is limited to a useful and practical application.

2. Applicants argue that the rejections made under 35 USC §102 (e) are not applicable to the amended claims because the Xavier reference does not teach the applicants' use of "free neighborhoods".

Examiner's Reply

18. In response to the applicant's arguments, the examiner respectfully disagrees for the following reasons:

1. The rejections made under Section 101 are maintained because the computation of swept volume is abstract unless it is limited to a real world object.
2. The rejections made under 102(e) and 103(a) are maintained because the applicants' use of "free neighborhoods" is indefinite and appears to correspond to the wrapper disclosed in the Xavier reference.

Conclusion

19. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Kandasamy Thangavelu whose telephone number is 703-305-0043. The examiner can normally be reached on Monday through Friday from 7:30 AM to 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kevin Teska, can be reached on (703) 305-9704. The fax phone number for the organization where this application or proceeding is assigned is 703-746-7329.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-305-9600.

K. Thangavelu
Art Unit 2123
May 15, 2002

SAMUEL BRODA, ESQ.
PATENT EXAMINER